4s2

Variable Temperature Thermal Sealer

Version: M Software Version 3.03 11 October 2011

4s2 VARIABLE TEMPERATURE THERMAL SEALER USER MANUAL

System Components

The following components are part of the 4s2 System (product code 4ti-0650):

- 4ti-0650 - 4s2 Heat Sealer
- Power Cable
- Manual & Quick User Guide
- 4ti-0615 - Plate Carrier
- 4ti-0602 - Weighted Platen

Replacement accessories and optional extras are to be ordered separately.

- 4ti-0625 - Plate carrier for 96well PCR Plates (optional extra)
- 4ti-0612 - Sealing Frame (supplied FOC with 4ti-0625)
- 4ti-0616 – Roche 1536 Plate Adapter (optional extra)
- 4ti-0626 - Warranty extension 1year (optional)
- 4ti-0627 - Warranty extension 2 years (optional)

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1.1 Introduction

The variable temperature thermal Sealer 4s2 is a semi-automatic instrument designed to seal sample plates made from various polymers.

The sealer can be used with most plate types and sealing films available. Both temperature and time are variable and can be optimised to suit each sealing plate and film.

When the 4s2 is ready to start the operator needs to position the sample plate together with a foil or film on the plate carrier. The sealing operation starts once the drawer with the plate carrier has been closed. Film and sample plate will then automatically be brought in contact with the heating platen.

As soon as the sample plate is in contact with the heating platen a countdown timer starts and after the chosen sealing time the motor automatically moves the sample plate away from the heating platen and the operator can remove the sealed sample plate for further processing.

1.2 Chapter Index

To use the 4s2 correctly and to obtain the best results, please read this manual carefully.

1.3 Safety

Before using the sealer please read the following safety notes.

This product must only be used in accordance with proper safety standards and procedures, together with the instructions included in this manual.
The sealer has been designed and manufactured to conform to international safety specifications.
It's essential that the users know the potential hazards associated with the equipment.

All operators should know and observe the safety precautions and warnings given in this section before starting to use the instrument.
If the unit is used in a way not specified by the manufacturer, the protection provided by the equipment may be ineffective.

The following caution and safety signs are used in this manual:

WARNING: Refer to manual

The machine is designed for indoor laboratory use only, at an altitude of less than 2200m above sea level, within a temperature range of 15°C to 35°C and a relative humidity range of 5% to 85% non-condensing.
If the instrument is stored outside these ranges, it should be left to stand until it equilibrates to within the above limits.
Ensure that the voltage selection switch is set to the correct voltage and that the correct fuse for the required voltage setting is fitted.
Do not work outside the rated power supply range.
Use the cleaning method recommended by the manufacturer.
Ensure the unit is only connected to an earthed supply.
There are no user accessible or serviceable parts inside the unit. Do not remove the unit's cabinet.

WARNING: Hot surface

The hot plate can reach temperature up to 200°C,
Care must be taken not to touch it or serious burns may occur.
The equipment will maintain a high temperature for a considerable time after switching off and it is essential to wait before starting cleaning operations.
Sealed sample plates may remain hot for some seconds after sealing and should be handled with care.

WARNING: Risk of electrical shock (high voltage)

This equipment should only be dismantled by properly trained personnel, removing the top case exposes potentially lethal mains voltages.

1.4 Applicable Rules

2006/95/CE	Low Voltage Directive
2004/108/CE	Electromagnetic Compatibility Directive
2002/96/CE	amended 2003/108/CE WEEE Directive

1.5 Technical Specifications

MECHANICAL

Dimensions

Height	310 mm
Depth	275 mm
Width	181 mm
Weight	9 kg

ELECTRICAL

Voltage	230/115/100 ±10% Vac
Frequency	47/63 Hz
Power	300 W

ENVIRONMENTAL

Temperature range	Operative: 18°C to 35°C
Storage	-20°C to 40°C
Relative humidity	20% to 80% not condensing

SOFTWARE

Version	3.03

SET UP PARAMETERS

Sealing temperature

Range	OFF or from 120°C to 200°C
Step	1°C
Default	OFF

Sealing time

Range	0 to 10 seconds
Step 0-1 second	0.1 second
Step 1-10 seconds	0.5 second
Default	3 seconds

Stand by cycle

Range	“no” stand-by or from 1 to 99 mins
Step	1 minute
Default	60 minutes
Stand by temperature:	60°C, not programmable

Power down time

Range	1 to 24 hours
Step	1 hour
Default	10 hours
Power down temperature:	Ambient

Audible Warning

Options	ON/OFF
Default	ON

2 GENERAL SPECIFICATION

2.1 Sealer Parts

Figure 1 Casing and Control Panel

Figure 2 - Rear Power Interface

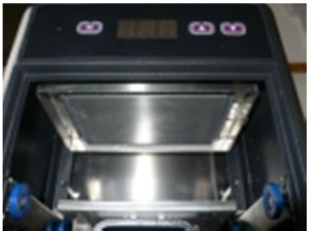

Figure 3 - Heating Platen

Figure 4 - Plate Carrier

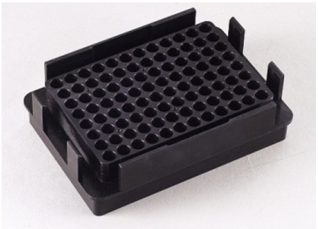

Figure 5 - 96well PCR Plate Adapter 4ti-0625 (optional)

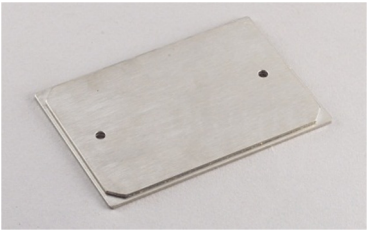

Figure 6 - Standard Plate Adapter 4ti-0615

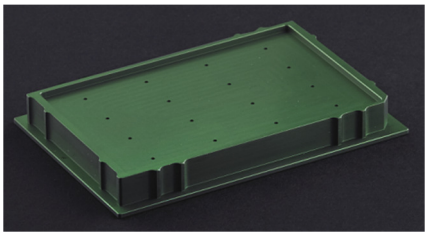

Figure 7 - Roche 1536 Plate Adapter 4ti-0616

Figure 8 – Weighted Platen 4ti-0602

Figure 9 - Sealing Frame 4ti-0612 (optional)

2.1.1 Control Panel

Set-up/Run Mode Key

Directional (up) Key

Directional (down) Key

Three digit LED display

Amber LED Status Indicator

Figure 10 - Control Panel

2.1.2 Rear Power Interface

Power Setting 115/230 Vac and Fuse Holder

I/O Power Switch

Mains Power Plug

Figure 11 - Rear Interface

3 INSTALLATION

3.1 Unpacking and Start-Up

After unpacking retain all packing material and fixtures, as the unit must always be transported in its original packaging to avoid damage.

The manufacturer accepts no responsibility for damage incurred unless the unit is correctly packed and transported in this way.

Remove the 4s2 unit from its packaging. Open the sealing drawer and remove the protective cardboard.

The unit has to be placed on a level surface, away from direct sunlight ensuring access to the power switch at the back of the unit.

Ensure that the vents on the casing are not obstructed.

The mains voltage selector switch should be checked to ensure that the voltage has been set at the correct value.

Connect the unit to the mains power supply and switch on the switch I/O of the rear power interface.

If the heater within the unit is receiving power the amber LED on the control panel will be illuminated.

After switching on wait until the amber LED light stops flashing (the set temperature is reached and the unit is ready to seal).

3.2 Voltage Check


Be sure that the equipment is not connected to the mains power.

At the rear of the 4s2 is the connection panel with:

- Power setting 115/230 Vac and Fuse Holder
- I/O Power Switch
- Mains Power Plug

The set voltage is displayed in white on red background on the power setting and fuse holder – see “Figure 11”, page 14.

Figure 12 - Opening fuse holder compartment

Figure 13 - Levering out fuse holder

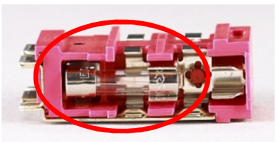

Figure 14 - Correct fuse location

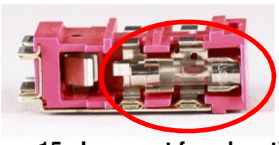

Figure 15 - Incorrect fuse location

Changing the Voltage Setting

1. Open fuse holder compartment with a screwdriver (Figure 12).
2. With the screwdriver lever out the fuse holder (Figure 13).
3. Replace the two fuses according to the table below:

Power Voltage	(EN 60127)
115V	3.15A (T)
230V	2A (T)

Table 1 - Fuse ratings for 4s2

4. Insert the fuse holder keeping the set voltage label at the top.
5. Close the fuse compartment by pressing gently.
6. If the fuse holder is inserted correctly you can read the voltage selected.

4 SET-UP

4.1 Set-Up Operating Mode

Turn on the 4s2 (switch located at back of the unit).

The display will show the software version for a couple of seconds and then show the temperature to which the 4s2 is currently set. The unit is delivered with the heater platen turned off. If this is the first time of switching the unit on, the keypad will display “oFF”. Otherwise, when switched on, the unit will start to heat up to the last set temperature and the LED light will flash whilst it is heating up.

To programme time and temperature settings:

- Briefly press and release the M key
- The display shows the last set sealing temperature (flashing)
- The temperature can be decreased or increased using the ⏷ ⏶ keys
- Temperature can be set between 120°C and 200°C with steps of 1°C or to “oFF”.
- Press the M key again to store the new set temperature and then the display will flash with “t” and the current sealing time (flashing).
- The sealing time can be decreased or increased with the ⏷ ⏶ keys
- Time can be set between from 0-1 second in 0.1 second increments and from 1-10 seconds in 0.5 second increments.
- Press the M key again to store the new sealing time value and this will also exit from the programme menu.
- The unit returns into “run mode” (see Chapter 5, Basic Functions, page 20) and the actual temperature of the heating platen is shown in the display.

4.2 Stand-by, Power Down and Audible Warning Control

To programme stand-by and power-down time and control the audible warning:

- Press the M key for 10 seconds, then release.
- The display shows the symbol “L” (flashing) and the last set stand-by time in minutes. (The stand-by time is the time after which the heater temperature is automatically reduced to 60°C when the unit is left idle).
- The stand-by time can be decreased or increased with the ⏷ ⏶ keys
- Time can be set between 1 minute and 99 minutes with steps of 1minute or as “no” standby.
- Press the M key again to store the new stand-by time and then the display will flash with “P” and the current power-down time (in hours). (The power-down time is the time after which the heater is switched off automatically when the unit is left idle).
- The power-down time can be decreased or increased with the ⏷⏶ keys
- Power-down can be set between 1 hour and 24 hours with steps of 1 hour
- Press the M key again to store the new power-down time and the display will flash with “S” and the current audible warning setting.
- The audible warning function can be enabled (“on”) or disabled (“no”) with the ⏷ ⏶ keys.
- Press the M key again to store the audible warning function and this will also exit from the programme menu.
- The unit returns into “run mode” (see Chapter 5, Basic Functions, page 20) and the actual temperature of the heating platen is shown in the display.

5 BASIC FUNCTIONS

5.1 "Run" Mode

Switch on the unit. The unit will automatically begin to warm up the heating platen to the last set temperature. The display shows the temperature increase in real time with the amber LED flashing.

When the heating platen reaches the set temperature an audible beep is emitted and the amber LED remains permanently illuminated.

The system is ready for sealing and the sample plate can be loaded onto the appropriate plate carrier:

Deep-Well Plates
All fully skirted SBS standard plates (except 96well PCR plates) can be loaded onto the standard plate carrier (4ti-0615, Figure 16).

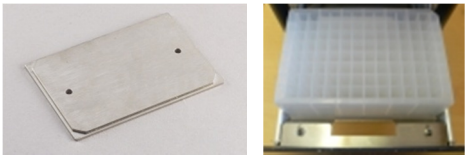

Figure 16 - Use the standard plate carrier (4ti-0615) for deep-well plates

Shallow-Well Plates
However, for easier handling of shallow well plates we recommend to place the standard plate carrier (4ti-0615) inside the adapter for 96well PCR plates (optional extra, code 4ti-0625, Figure 17).

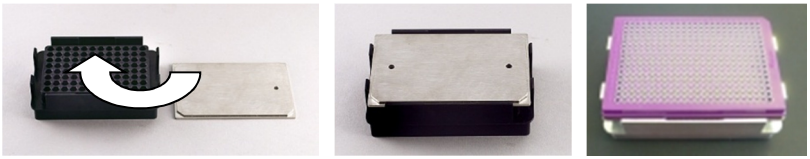

Figure 17 - The standard plate carrier (4ti-0615) can be placed inside the adapter for 96well PCR plates (4ti-0625). This is recommended for skirted shallow well plates, such as 384well PCR plates

96well PCR Plates

All 96well PCR plates should be inserted into the 96well PCR plate adapter (product code 4ti-0625, Figures 18 &19). Note: When using the 96well PCR plate adapter the standard plate carrier should be removed from the drawer.

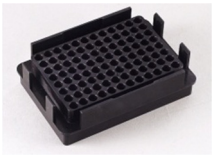

Figure 18 - Plate adapter for 96well PCR plates (optional, code 4ti-0625)

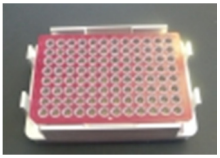

Figure 19 - Plate adapter for 96well PCR plates, shown with non-skirted PCR plate

Roche 1536well Plates

For use with a Roche 1536 plate, insert the Roche 1536well plate adapter (4ti-0616) inside the adapter for 96well PCR plates (optional extra, code 4ti-0625, Figures 20 & 21).

Figure 20 - The Roche 1536 adapter (4ti-0616) should be placed inside the adapter for 96well PCR plates (4ti-0625). This adapter is required for Roche 1536well plates.

Place the sealing film over the plate, ensuring that the sealing surface is face down (Figure 20). When using heat sealing films that have a tendency to curl (for example 4titude Peel Seal (product code 4ti-0521), DMSO Resistant Seal (4ti-0587) and Clear Weld Seal Mark II (4ti-0575)) use the sealing frame which is supplied with the 4ti-0625 adapter. For deep well plates place the weighted platen on top of the sealing film (Figure 21). For most other plates we recommend the use of the sealing frame (Figure 22).

Figure 21 - Position sealing film / foil on plate

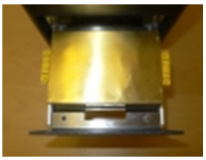

Figure 22 - Position weighted platen over sealing film / foil

Figure 23 - Position sealing frame over sealing film / foil

Push the drawer in fully and hold until you can hear an audible warning that indicates the door has been locked. The microplate with the sealing film will now be lifted up and brought into contact with the heating platen.

Figure 24 - Close the drawer to start sealing

***Note**: If the drawer is not pushed in fully the locking mechanism may fail and the motor will stop moving. An error message ("push&hold") will be displayed and a continuous audible beep will be emitted. To rectify this and to continue with the sealing process push the drawer in fully until you can hear a beep. If the problem persists it may be necessary to switch the unit off and then on again.*

As soon as the sample plate makes contact with the heating platen the display shows the symbol "t" and the countdown of the programmed sealing time starts.

When the countdown timer reaches zero the unit emits an audible beep and the drawer is released. The operator can pull out the drawer and remove the sealed plate.

The unit will emit an audible beep as soon as the heating plate has reached the programmed temperature again and a new cycle can be started within a few seconds.

***Note:** Foil backed film may remain hot for a number of seconds after sealing. Care should be taken in handling these plates.*

5.2 "Stand-by" Mode

If left idle for a prolonged time the sealer will automatically switch into stand-by mode (factory set at 60 minutes) and the temperature of the heating plate will be reduced to 60°C.

When entering into stand-by mode the display shows the decrease of the temperature in real time and the amber LED is switched off.

The temperature of the heating platen will be maintained at 60°C.

The display shows the actual temperature of the heating platen and not the set sealing temperature.

By pressing any key the unit will automatically begin to warm up the heating plate to the pre-selected sealing temperature.

Refer to section 4.2 to change the time after which the unit switches into stand-by mode or to switch off the stand-by function.

5.3 "Power-down" Mode

If the unit remains idle in stand-by mode for a prolonged time the system will go into power down mode and the heating platen will be switched off (factory set at 10 hours). The amber LED is switched off.

The display shows the temperature decrease until it reaches 45℃, after this "LO" will be displayed.

By pressing any key the unit will automatically begin to warm up the heating platen to the pre-selected sealing temperature.

Refer to section 4.2 to change the time after which the unit switches into power-down mode.

5.4 Drawer Locking

It is possible to lock the when the unit is not used to prevent damage or dust contaminating the internal parts of the unit.

To lock the drawer, proceed as follows:

- While pressing the ⏼ key close the drawer
- The plate lifting platform moves up and the drawer is locked
- Switch OFF the unit
- To unlock the drawer switch ON the unit.

Note: *Do not use this function whilst the unit is in transport*

6 TROUBLESHOOTING

6.1 Introduction

Possible error messages generated by the 4s2 are summarised in this chapter.
If the solutions given below do not solve the problem, please contact 4titude or their authorised local distributor.

6.2 Error Messages

The display may show one of the following error codes. An intermittent audible warning sound will be emitted at the same time.

Display Message	Error
Er1	The system cannot reach the starting position within a defined time
Er2	The lifting platform does not remain in the elevated position
Er3	The motor cannot move the lifting platform towards the heating plate within a defined time
Er4	The motor cannot move the lifting platform to the low position within a defined time
Er5	Motor over current
Er6	Temperature sensor opened or disconnected
Er8	“Platform in low position sensor” active during elevation movement
“push&hold”	The drawer has not been pushed in fully and the locking mechanism has failed. Push in the drawer again until an audible beep is heard. If the problem persists, turn off the unit and turn on again.

The errors will remain displayed until the problem is solved. To clear the error please retry the operations that generated the error, e.g. error 7 may occur if the drawer is pushed in but released before the motor sets in motion. To solve the problem please push in the drawer again and hold until an audible warning is heard.

If any of the above errors persists switch “OFF” the unit and then switch “ON” again.

If within 10 seconds the problem is not solved the heated plate is automatically turned off to avoid sample damage.

If the problem is solved within 10 seconds the unit will automatically return to “Run Mode”.

6.1 Cleaning the Heating Platen

If the operator places the sealing film upside down on the microplate or PCR plate, the sealing film may get stuck on the heated sealing plate. To clean it, proceed as follows:

Do not attempt to clean the unit until it has cooled down to near room temperature

- Switch “OFF” the unit
- Disconnect the unit from the mains power supply
- Release the lever on the back of the unit counterclockwise (see Figure 24)

Figure 25 - Lever in "locked" position

- The drawer can now be fully removed from the unit

Figure 26 - Remove drawer

- Peel off the sealing film from the heater platen, inside the unit, by hand and clean with a paper towel if required.

***Note**: The cleaning operation is much easier when the heater platen is near ambient temperature!*

- Reinsert the drawer into the unit
- Move the lever on the back of the unit clockwise to secure the drawer mechanism (see Figure 26)

Figure 27 - Lever in "open" position

- Switch unit on

7 MAINTENANCE

7.1 Regular Maintenance

The unit does not require regular maintenance but it should be kept clean.

The heat sealer can be cleaned with a cloth dipped in water or ethanol (methanol, formaldehyde can also be used).

The unit should not be immersed in solvents.

Do not use acetone or abrasive cleaners.

No parts are to be autoclaved.

In case of radioactive spillages it is recommended to use an appropriate cleaning agent.

For any other maintenance operation not indicated in this manual, please contact 4titude.

Any cleaning procedure must be followed with the unit switched off, the power cable disconnected and the heated parts at ambient temperature

8 ACCESSORIES AND CONSUMABLES

The 4s2 is designed to be used with the following consumables:

8.1 Plate Types

Any of the following made from polypropylene, polyethylene or polystyrene.

- SBS format shallow well plates
- Deep-well plates
- Tube blocks (various)
- PCR plates

8.2 Thermal Sealing Plastic or Sealing Film types

- Foil-polypropylene laminate
- Clear polyester-polypropylene laminate
- Clear polymer
- Thin clear polymer
- Foil-laminate
- Foil

8.3 Plate Carriers and Accessories

- Standard Plate Carrier for skirted plates (included, product code 4ti-0615) – see page 13, Figure 6
- Plate carrier for 96well PCR plates (optional extra, product code 4ti-0625) – see page 13, Figure 5
- Roche 1536 Plate Adapter (optional extra, product code 4ti-0616) see page 13, Figure 7
- Weighted Platen to hold down sealing sheets (included, code 4ti-0602) – see page 13, Figure 8
- Sealing Frame to hold down sealing sheets (included with plate carrier 4ti-0625 or use code 4ti-0612 to order a replacement frame) – see page 13, Figure 9

9 SEALING PARAMETERS

The following sealing temperatures are for guidance only. Sealing efficiency varies depending on the plate type used.

Add 1 second to the sealing time when a weighted platen is used (4ti-0602)

		Temperature (°C) / Dwell Time (secs)		
Part number	**Description**	**96-well PCR Plates***	**384-well PCR Plates***	**Vision Plates™^**
4ti-0541	Clear Seal	175-185 / 2-3	165-180 / 3	185-200 / 3
4ti-0575	Clear Weld Seal Mk II	175-180 / 2-3	170-175 / 2-3	-
4ti-0581	Clear Seal 3730	165-175 / 3	165-175 / 2	175-185 / 2-3
4ti-0521	Peel Seal	175-185 / 3	170-175 / 2-3	-
4ti-0587	DMSO Resistant Peel Seal	175-185 / 3	170-175 / 2-3	-
4ti-0531	Pierce Seal	160-175 / 2	160-175 / 2	185-200 / 3
4ti-0536	Foil Seal	165-180 / 2	160-175 / 2-3	185-200 / 3
4ti-0547	PS Foil Seal	-	-	185-200 / 3
4ti-0527	Black Seal	-	-	185-200 / 3
4ti-0591	Thermal Bond	170-180 / 2-3	160-170 / 2	-
4ti-0595	Gas Permeable Heat Seal	165-175 / 3	165-175 / 3	175-185 / 3

Table 2 - Sealing Temperatures and Times for different types of plates

* These values are for two-component PCR plates. For one-piece polypropylene plates, increase dwell time by one second.

^ These values can be used for all polystyrene plates

All sealing parameters were estimated using software version 3.03

These values are for guidance only. It is advisable to conduct trials depending on the plate type being sealed.

10 SHIPPING INSTRUCTIONS

When shipping the unit the original packaging must be used to prevent damage to the instrument.

The manufacturer accepts no responsibility for damage incurred unless the unit is correctly packed as described below and transported using the original packaging.

1. Before shipping remove the plate carrier(s) from the unit.

   Note: *If left inside the unit the plate carriers may cause severe damage to the sealer!*

2. Switch off the unit.
3. Pull out the drawer.
4. Place card board sheet (provided) between the underside of the drawer and the top of the lifting platform inside the unit.
5. Push drawer in.
6. Replace cardboard insert in drawer

   Note: *if the unit is shipped without the cardboard insert in the drawer, the front panel can be damaged during shipping. Also note, do NOT lock the drawer, as described on page 23.*

7. Place the sealer between the two foam inserts inside the original shipping box.
8. Place the accessories in the smaller cardboard box and place on top of the foam inserts.
9. Close the box using a suitable adhesive tape.

11 WARRANTY

The manufacturer warrants that the product is free from defects in materials and workmanship for a period of 12 months from the date of purchase.

The manufacturer warrants the services it performs and the spare and replacement parts provided, for a period of 90 days from the date of the performance of such services and the date of shipment of the spare or replacement parts, respectively.

The manufacturer warrants that its software enclosed with the product, for a period of 90 days from the date its software is received by the customer, shall perform substantially in accordance with the standard set forth in the user documentation related to such software.

Used/refurbished products that are sold “As Is” are not covered by warranty. Additional coverage plans may be purchased.

If the manufacturer receives note of defects or non-conformance during the warranty period, the manufacturer, will at its option, repair or replace the affected product. The manufacturer will provide at no additional charge parts and labour for factory repairs.

The consumables and shipping costs are not covered under warranty.

Loss, damage or defects resulting from transportation, from external causes not imputable to the manufacturer, from inadequate maintenance, from improper use of the instrument (e.g. operations prohibited or not detailed in the user manual) are not covered under warranty. The manufacturer does not warrant that the operations of the product will be uninterrupted or error free.

The purchaser must control that the installation has been made in a correct way, in compliance with safety standard and law dispositions.